

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

Device for vaporising essential oils

This invention relates to a device for vaporising perfumed oils or liquids, or essential oils. In particular, the invention relates to a device which is especially suitable
5 for the vaporising of essential oils within a vehicle for the benefit of the occupants of the vehicle.

It is well-known to allow vapour to disperse in the air in an enclosed environment for the purpose of "air freshening": that is, the dissemination of a perfume
10 to mask the presence of less attractive odours. The commonest form of air freshener is a spray, but known alternatives are a slow-release gel and an impregnated disc which is heated electrically to induce vapour to be emitted. Air fresheners specifically for use in cars are also known. These are generally of the slow release kind, vapour being given off slowly from a solid or gel placed within the driver and passenger space of the
15 car.

Essential oils can provide this odour masking function and can serve as air fresheners. However, essential oils can also offer other and more valuable properties. Aromatherapy is a form of therapeutic treatment in which the subject inhales in vapour
20 form an essential oil with an appropriate therapeutic property. Different essential oils, used singly or in blends, can be used to treat illness or other disease or used to promote desirable physical states, such as mental alertness or relaxation. An example of such an oil is eucalyptus, known for its aroma and decongestant properties.

25

An aspect of the invention is the realisation that the properties of essential oil vapours render them especially suitable for use in a car or other vehicle in place of a conventional air freshener, which does not convey any particular benefit to health. Appropriately chosen essential oils can perform the odour masking function of a
30 conventional air freshener. They can also provide many other functions of particular value to a car driver or passengers, as is discussed below.

Appropriately chosen oils can stimulate the driver so he or she remains mentally alert and able to concentrate fully on driving, so the risk of accidents caused by driver drowsiness is reduced. Other oils can act to reduce tension and stress in subjects: reduction of tension and stress levels in drivers can also be an important factor in reducing the risk of accidents.

5

A car provides a confined environment where air is not freely exchanged with the surroundings and where driver and passengers frequently remain in close proximity. Such an environment places occupants at particular risk to the spread of disease. Appropriately chosen essential oils can act to minimise this risk. Certain oils have
10 antiseptic properties. Other oils are effective against certain diseases, such as colds and influenza. Oils can also act against symptoms of disease, such as nasal congestion.

In addition to the risk of disease, the atmosphere within a car provides other hazards for the occupants. Levels of pollution within a car are generally significantly
15 higher than those found outside it: for a car driven within a city, this means that the car driver and passengers are suffering extremely high levels of pollution. This can be of danger to sufferers from asthma and hay fever. Again, an appropriate choice of essential oils can alleviate these problems.

20 Essential oils can also alleviate other afflictions associated with car travel, such as motion sickness. It also follows that essential oils can be of assistance in other forms of travel, such as coach, air or rail travel. For example, an oil with decongestant properties could be used in air travel to ease the discomfort of passengers during rapid ascent and descent of an aeroplane on take-off and landing.

25

Use of essential oils in a car environment is not straightforward. It is not readily possible to provide such oils in a gel or solid form as is used for conventional car air fresheners. Such conventional methods are also not versatile: it is highly desirable for a user to be able to change the essential oil or blend of essential oils
30 frequently to match the effect desired. For example, a user suffering from a cold may wish to employ an essential oil to counteract the disease or the spread of infection, but

may wish to replace this with an oil which promotes mental alertness if a long journey is to be undertaken.

Accordingly, the invention provides a device for vaporising perfumed oils or liquids, or essential oils within a vehicle, comprising:

5

a heating element connectable to an electrical supply within a vehicle;

a receptacle for holding of perfumed oils or liquids, or essential oils to be vaporised; and

10

a passage for vapour from the receptacle out of the device.

Preferably, the device also comprises a heat reservoir for storage of heat provided by the heating element and for transmission of the stored heat to the
15 receptacle. This feature is of particular benefit in allowing the supply of heat to the oil to be controlled. A relatively short period of electrical supply to the heating element from a powerful electrical source can thus serve to heat up the reservoir, which supplies heat to the essential oil in the reservoir at a slower rate to provide gradual vaporisation of essential oil. This obviates a potential problem of rapid supply of heat to the
20 receptacle resulting in excessively rapid vaporisation of the essential oil. Ceramic materials are especially appropriate as materials for use in such a heat reservoir.

In particularly preferred embodiments, the device is adapted to engage in the cigarette lighter socket of a car. Although this is particularly preferred, it is envisaged
25 that devices according to the invention can be adapted for use with any available electrical connection. Appropriate modifications can thus be made to devices for use in air, rail or coach travel. One possibility is that a portable battery operated power supply could be used.

30 It is necessary for there to be a passage whereby vapour can escape from the receptacle. However, it is also desirable for the device to be constructed such that

essential oils cannot be spilled. In a preferred embodiment, the receptacle is therefore provided with a plug capable of motion relative to the receptacle. Relative motion between plug and receptacle is such that the plug seals the passage for escape of vapour when the device is oriented such that essential oil could otherwise flow through it.

5 In preferable embodiments of the invention, the heating element and receptacle are configured such that a face of the receptacle closest to the heating element is either convex or concave. This increases the surface area of the receptacle most directly exposed to heat, thus facilitating heat transfer to the essential oil in the receptacle.

10 The specific dimensions of the device can be tailored to meet the requirements of the socket into which the device is to be inserted.

 In a further aspect of the invention, the receptacle may be integral with the device as a whole and not replaceable, as is generally the case in other embodiments.
15 Alternatively, the receptacle may be removable to facilitate cleaning. This aspect, wherein the receptacle may be integral with the device as a whole and not replaceable, applies particularly for devices adapted to engage in the cigarette lighter socket of a car. The upper part of the device is adapted to receive a replaceable fluid bottle for storage of the essential oil, the receptacle within the device being used only to vaporise oil
20 provided as a dose from this replaceable bottle. Advantageously, the replaceable bottle is provided with a dosing valve, so that on actuation, a predetermined dose of essential oil is provided from the bottle to the receptacle. The upper part of the device according to this aspect contains two channels, one adapted to convey liquid from the bottle to the receptacle, and the second adapted to allow vapour to be released from the receptacle
25 to the surroundings.

 According to a preferred embodiment, the upper part of the device is provided with a cover member which, following insertion of a replaceable fluid bottle into the upper part of the device, is engageable with the base of the fluid bottle. When so
30 engaged, accidental displacement of the bottle from the upper part of the device is prevented. During use of the device, downward pressure on the cover member causes

abutment of the cover member with the base of the fluid bottle, whilst further downward pressure urges the bottle deeper into the upper part of the device and causes actuation of the bottle dosing valve.

In its preferred embodiment, the device according to the present invention is
5 small, light and readily portable. The device is provided with a simple installation means, for example the device is slidably engageable with a cigarette lighter socket in an automobile, and is designed to cause the user minimum inconvenience during non-use and transportation to the vehicle in which the device is to be installed.

10 Preferably, the device according to the present invention is generally cylindrical, preferably no more than 30 cm in height, more preferably not more than 20 cm in height, most preferably not more than 15 cm in height. Preferably, a major part of the device fits into the vehicle socket, the latter of which is preferably a cigarette lighter socket. The device is capable of fitting in the hand and is "pocket-sized".

15

The definition of automobile within this specification is intended to include not only cars, but also trucks, buses, mini-buses and equivalent transport means in which the vehicle is supported by wheels.

20

Suitable fluids for use in the device according to the present invention include:
blends of essential oils and carrier oils;
blends of essential oils and water;
conventional perfumes;
25 other aromatic oils and carrier fluids;
user medications capable of vaporisation; and
combinations of the above.

Specific embodiments of the invention are described below, by way of example,
30 with reference to the accompanying drawings, of which:

Figure 1 shows an elevation of a first embodiment of a device according to the invention;

Figure 2 shows a plan view of the device of Figure 1;

5 Figure 3 shows a longitudinal sectional view of the device of Figure 1;

Figure 4 shows a transverse sectional view of the device of Figure 1;

10 Figure 5 shows an elevation of a second embodiment of a device according to the invention;

Figure 6 shows a plan view of the device of Figure 5;

15 Figure 7 shows a longitudinal sectional view of the device of Figure 5;

Figure 8 shows a transverse sectional view of the device of Figure 5;

20 Figure 9 shows a longitudinal sectional view of a third embodiment of a device according to the invention;

Figure 10 shows a plan view of the device of Figure 9; and

Figure 11 shows an elevation of the device of Figure 9;

25 Figure 12 shows a vertical sectional view of a fourth embodiment of a device according to the invention;

Figure 13 shows a plan view of the device according to Figure 12;

30 Figure 14 shows an elevation of the device according to Figure 12.

Figure 3 depicts a longitudinal sectional view through a first embodiment of a device according to the invention. The device as a whole is constructed to operate in a standard cigarette lighter socket of a car.

A heating element 1 is mounted at the base of the device for operative
5 connection with the power supply to the cigarette lighter socket. The heating element 1 is in this case a coil formed from a wound strip of metal, of the kind found in conventional car cigarette lighters. Sprung metal strips 3 are provided at the side of the device to provide the necessary earth connection to the socket.

10 Preferably, the activation of the heating element is as for a conventional car lighter. The device as a whole is pressed into the socket to engage the heating element with the power supply. A trip switch is then activated to disengage the heating element from the power supply when a sufficient temperature has been reached.

15 A receptacle 5 for storage of essential oil to be vaporised is located in the centre of the device. The top of the receptacle, in use, is open. A passage is thus provided, through vents 7 (see Figure 2), for vapour to flow out from the receptacle 5 and out of the device.

20 The device also comprises a thermal reservoir 9 consisting of a ceramic material with a high thermal capacity. This thermally buffers the oil in the receptacle from the heating element, and therefore allows short bursts of the relatively high heating current provided through a conventional car lighter socket to a conventional heating coil to be dissipated gradually into the heating of the receptacle 5 and thus of the essential oil
25 contained therein. Such operation requires the main body 11 of the device to provide substantial thermal insulation for the interior of the device.

The receptacle 5 is mounted within the device so that it is free to move longitudinally. A plug 13 is fixed on the main body of the device, just above the
30 opening in the receptacle 5. If the device is tipped, the receptacle 5 will slide towards the plug 13 and the plug will seal the opening, preventing any essential oil from flowing

out.

Figure 7 shows a similar longitudinal section of a second embodiment of a device according to the invention. This embodiment is also designed for use in the cigarette lighter socket of a car. Where components are essentially similar to those employed in the first embodiment, the same reference numbers have been used.

In this embodiment, there is an on/off switch 21 by which the user can determine whether heat is supplied to the heating element in the device. This switch is advantageously of the spring-loaded type, activated by the user pushing the device into the socket, each push toggling the device between a state in which the element is in electrical contact with the power supply and a state in which it is not. In this case a differently constructed heating element 27 is provided for direct heating of the receptacle, with ceramic material 9 providing both insulation and a heat reservoir. The upper surface of the heating element 27 is convex, matching a concave portion 23 of the receptacle 5. The surface area over which heat can pass directly from the heating element 27 to the receptacle 5 is thereby increased. Ceramic material can be provided as a mild heat buffer between the heating element 27 and the receptacle 5. A light emitting diode 25 is mounted on the device and electrically connected to the switch 21, thus displaying to the user whether or not current is being supplied to the device.

20

It should be noted that a much less powerful heating element is required in the second embodiment of the device than in the first embodiment. In the second embodiment, it is desirable for the energy that will be supplied to (and by) the heating element to be comparable to that required to vaporise essential oil. Even with a heating element of this type, it is undesirable for the device to be left on at all times that there is power supplied to the lighter socket. It is thus highly desirable, though not essential to the basic concept of the invention, that there be a switch element present.

The following dimensions are appropriate for the device illustrated in Figures 1 to 8.

30

Preferably, the narrow end of the main body which is insertable into the vehicle socket has the following dimensions:

diameter between 1.5 cm and 3.0 cm, more preferably between 1.8 cm and 2.2 cm;
height between 5 cm and 15 cm, more preferably between 5 cm and 10 cm.

5 Preferably the wide end of the main body which usually protrudes from the vehicle socket has the following dimensions:

diameter between 1.5 cm and 5.0 cm, more preferably between 2.0 cm and 3.5 cm;
height between 2.0 cm and 10 cm, more preferably between 2.0 cm and 7.0 cm.

10 A further embodiment of a device according to the invention is shown in Figure 9. This embodiment is also designed for use in the cigarette lighter socket of a car. This embodiment resembles in its lower part both the first and second embodiments. However, from the receptacle 5 upwards there is a modification. Receptacle 5 is not
15 shown in Figure 9: this may be a separate receptacle as shown for the first two embodiments, or alternatively may merely be defined by appropriate inner walls of the device, the receptacle thus being integral with the device rather than a separate replaceable component. Figure 9 shows only the cap region of the device above the receptacle and the heating region.

20 In the embodiment shown in Figure 9, there is a cap 39 to the device which contains a recess in which a replaceable bottle 35 may be inserted. Bottle 35 provides the storage for the essential oil to be used in the device. In the unused state, the bottle may be removed: in any event, when the device is not actuated no fluid passes from the bottle 35 to the receptacle 5, which now acts only for holding essential oil during
25 vaporisation. Bottle 35 is provided with a dosing valve 33, which may be a conventional type (for example, of the type used in certain conventional perfume dispensers), adapted such that when bottle 35 is pressed downward into its recess, the dosing valve 33 releases a predetermined dose of essential oil into channel 36. This then flows downward into the receptacle 5. For convenience, the device is adapted so
30 that downward pressure on bottle 35 both releases a dose of fluid into channel 36 and also provides the necessary engagement for urging the device into the cigarette lighter

socket to provide electrical connection to the heating element. Vapour from the essential oil then heated in receptacle 5 is allowed to pass upwards through channel 37 where, from which it can escape into the atmosphere. This embodiment provides an economical and effective design which is both simple to manufacture and use and allows use of readily available components.

5

The embodiment shown in Figure 12 represents a further embodiment of the cap region of the device illustrated in Figure 9. In this embodiment, however, the vertical walls of cap 39 which define the recess into which bottle 35 may be inserted are more elongate than those of cap 39 in Figure 9. Accordingly, the base 35a of bottle 35 only
10 slightly protrudes from the mouth of the cap 39. A cover member 40 is mounted via hinge 41 to the cap 39. The hinge 41 allows movement of the cover member 40 between an open position, in which a bottle 35 is insertable through the mouth of the cap 39 and into the recess of the cap 39, and a closed position in which accidental displacement of the bottle 35 is prevented. The cover member 40 has a flexible portion
15 which is shaped such that, when the cover member 40 is in the closed position, it accommodates the base 35a of bottle 35 protruding from the cap 39. Downward pressure on the flexible portion of the cover member 40 causes that portion to flex and abut with the base 35a of bottle 35. Further downward pressure urges the bottle 35 downward into the recess, causing actuation of the bottle dosing valve 33 by abutment
20 of said valve with an inside surface of the cap 39. A predetermined dose of essential oil is released into channel 36 which then flows into the receptacle 5. The bottle 35 is then returned to its start position by means of the self-sprung dosing valve 33. A safety lid 42 is hingedly mounted to the cap 39 via hinge 41. The safety lid is made from a rigid material. The hinge 41 allows movement of the safety lid 42 between an open and
25 a closed position as for the cover member 41. When the safety lid 42 is in the closed position the cover member 41 (especially the flexible portion thereof) is isolated from the environment exterior to the device and accidental application of downward pressure to the cover member 41 is prevented, thereby preventing inadvertent actuation of the dosing valve 33 and subsequent discharge of fluid from the bottle 35.

30

The following dimensions are appropriate for the device illustrated in Figures 12 to 14.

The dimensions of the dosing device are tailored to the size of the storage body and are such that the dosing device is supportable by the generally cylindrical main body. The preferred dimensions of the dosing device are:
5 diameter between 1.5 cm and 5.0 cm, more preferably between 2.5 cm and 3.5 cm; height between 4 cm and 9 cm, more preferably between 6 cm and 8 cm, most preferably 7 cm.

10 The dosing device in Figures 12 to 14 tapers in diameter towards a neck which is slidably engageable with the wide end of the main body. The neck has a preferred diameter of between 2 cm and 4 cm, most preferably 2.5 cm and has a preferred height of between 0.5 cm and 2 cm, preferably 1 cm.

15 Figure 14 shows the cover member 40 with the flexible portion 40a. In this figure, the safety lid 42 has been removed.

Further features can be employed in other, unillustrated, embodiments of devices according to the invention. One method of providing efficient supply of heat to the
20 receptacle is to mount it within a casing, the casing having fixed to it a heating element made of resistance wire, or of a resistance element such as that used in car windscreens. The heating element can then be designed to form a spiral wrap around the receptacle along its length.

25

The skilled person would appreciate that the above described embodiments of the present invention could be automated. Thus the necessary bottle depression and dosage valve actuation could be carried out via a press button-solenoid actuator unit and a small motor.

CLAIMS:

1. A device for vaporising perfumed oils or liquids, or essential oils within a vehicle, comprising:
 - a heating element connectable to an electrical supply within a vehicle;
 - a receptacle for holding of perfumed oils or liquids, or essential oils to be
 - 5 vaporised; and
 - a passage for vapour from the receptacle out of the device.
2. A device according to Claim 1, wherein the device is adapted to engage with an electricity supply socket within the vehicle, said socket providing the electrical supply
- 10 to the device.
3. A device according to Claim 2, wherein the electricity supply socket is a cigarette/cigar lighter socket and the vehicle is an automobile.
- 15 4. A device according to Claim 2 or Claim 3, wherein when the device and the socket are so engaged the socket substantially supports the weight of the device.
5. A device according to any of the preceding claims, which further comprises a trip switch which is activated to disengage the heating element from the electrical
- 20 supply when a pre-determined temperature has been reached.
6. A device according to any of the preceding claims which further comprises a heat reservoir for storage of heat provided by the heating element and for transmission of the stored heat to the receptacle.
- 25 7. A device according to any of the preceding claims, wherein the receptacle comprises a plug which is capable of motion relative to the receptacle, such that the plug seals the passage for escape of vapour when the device is oriented such that the perfumed oil/liquid or essential oils could otherwise flow through said passage.
- 30 8. A device according to any of the preceding claims, which further comprises a

dosing component comprising:

a cap which is engageable with the receptacle and which supports an upper member, said cap possessing two bores, wherein the first bore provides the passage for escape of vapour from the receptacle out of the device, and wherein the second bore
5 provides communication means between the receptacle and the upper member; and wherein

the upper member defines a recess for receiving a storage bottle of perfumed oil/liquid or essential oil, said storage bottle having a dosing valve which on actuation
10 releases a predetermined dose of oil or liquid, via the second bore in the cap, into the receptacle.

1/4

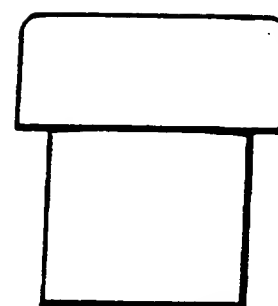


Fig.1.

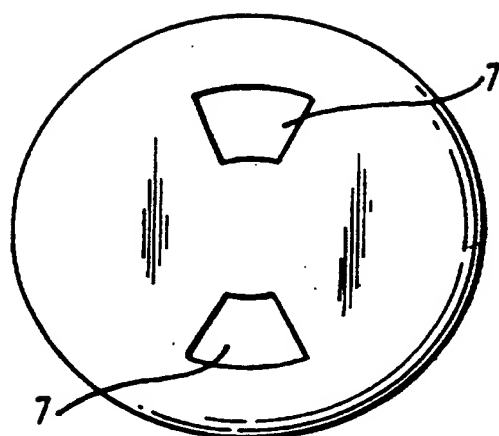


Fig.2.

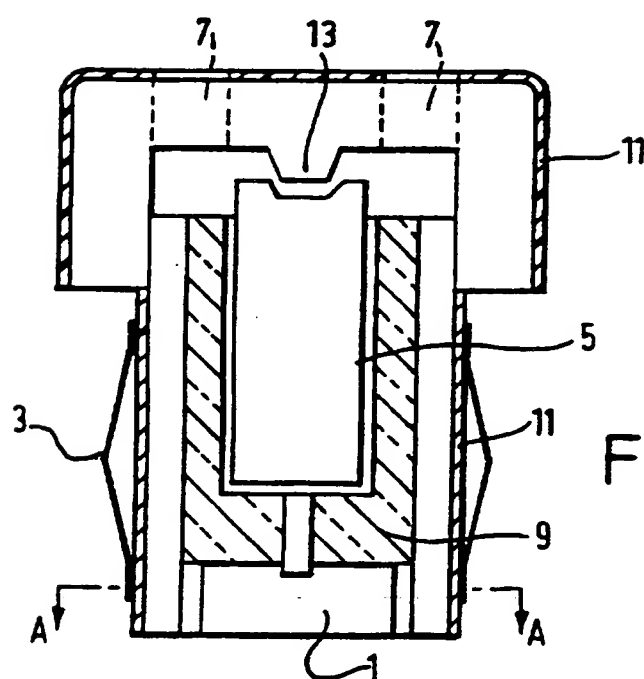


Fig.3.

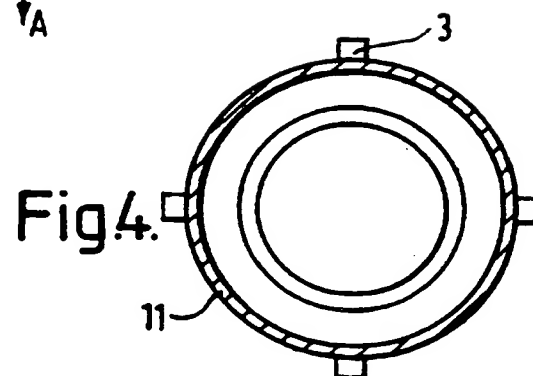


Fig.4.

2/4

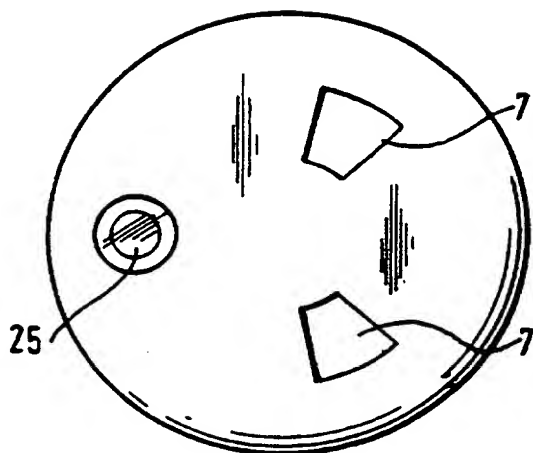


Fig. 6.

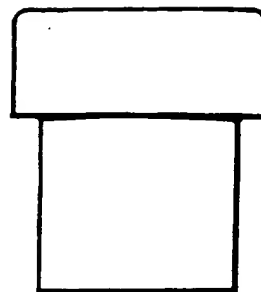


Fig. 5.

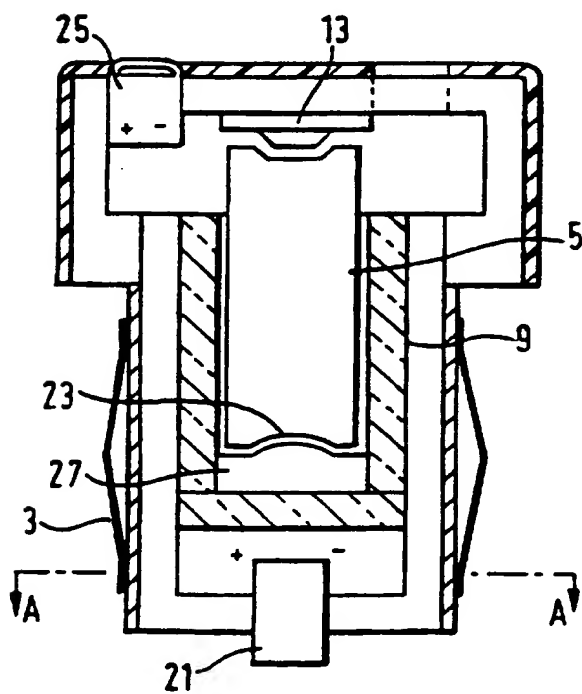


Fig. 7.

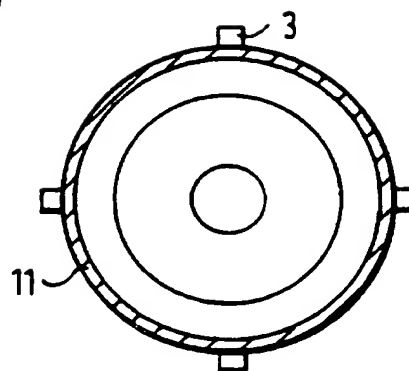


Fig. 8.

3/4

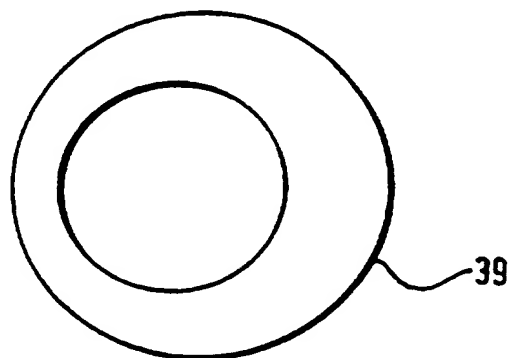


Fig.10.

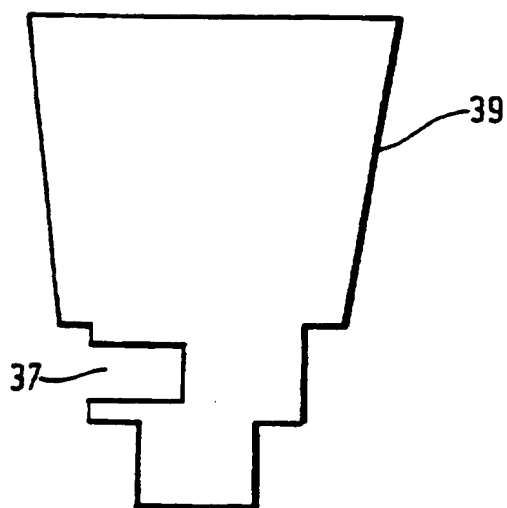


Fig.11.

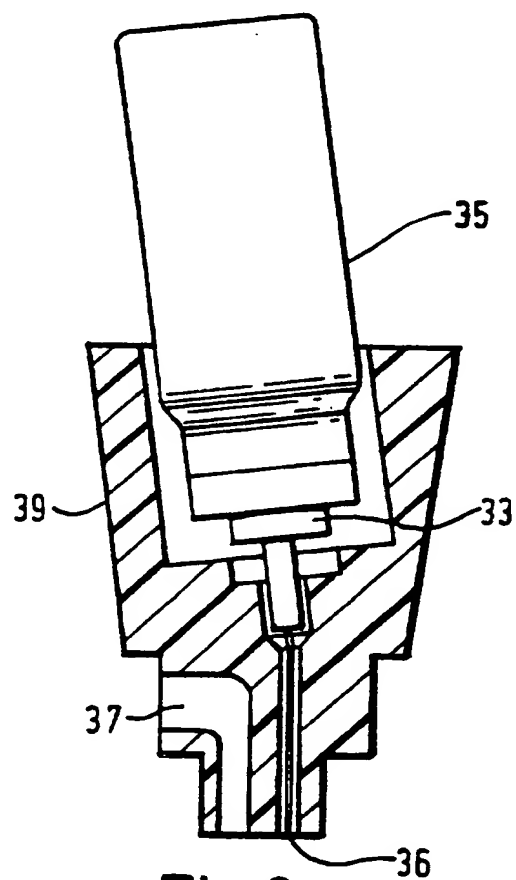


Fig.9.

4/4

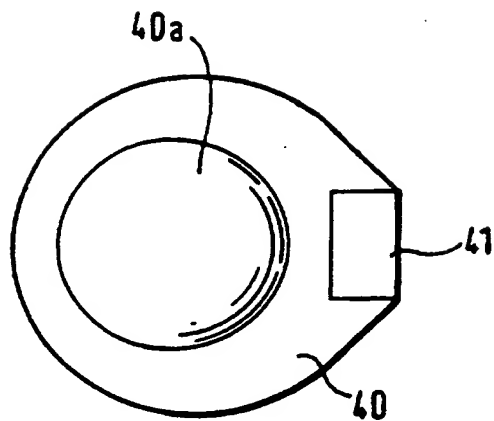


Fig.14.

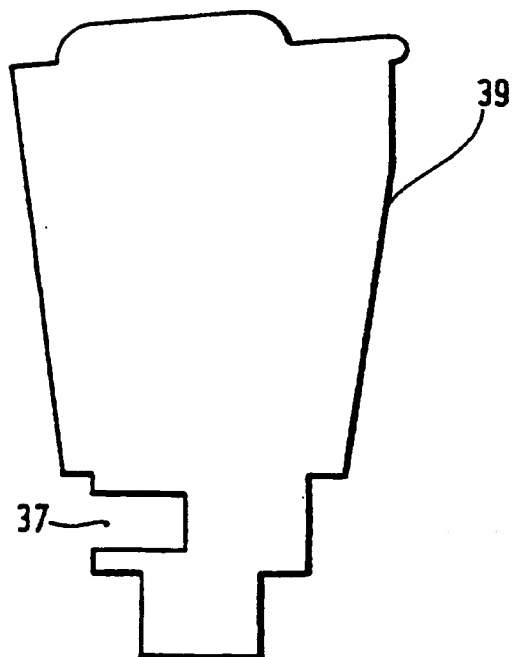


Fig.13.

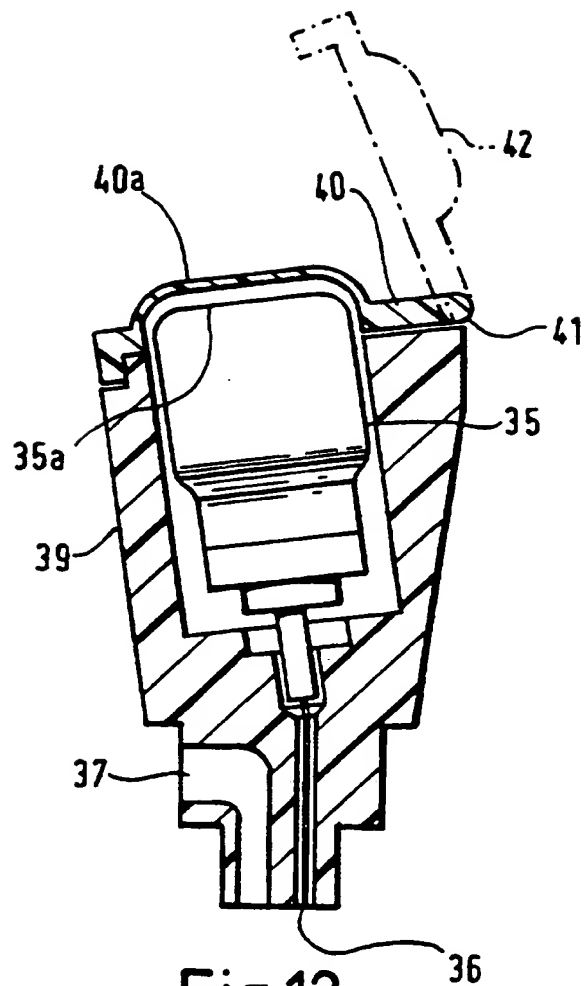


Fig.12.

INTERNATIONAL SEARCH REPORT

Int. Patent Application No
PL/GB 97/00633

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61L9/03 A01M1/20 B60H3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 373 581 A (SMITH JAMES S) 13 December 1994 see claims; figures	1-8
X	FR 2 626 452 A (RG2E) 4 August 1989 see claims; figures	1-5
X	FR 2 618 330 A (GRENET E P) 27 January 1989 see the whole document	1
A	US 5 432 882 A (GLYNN JOHANNE M) 11 July 1995 see figures	1-8
A	US 4 686 353 A (SPECTOR DONALD) 11 August 1987 see claims; figures	1-8
-/--		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- *&* document member of the same patent family

Date of the actual completion of the international search

5 June 1997

Date of mailing of the international search report

16.06.97

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+ 31-70) 340-3016

Authorized officer

ESPINOSA, M

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 97/00633

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 574 181 A (SPECTOR DONALD) 4 March 1986 see claims; figures ---	1-8
A	US 4 692 590 A (SPECTOR DONALD) 8 September 1987 see claims; figures ---	1-8
A	GB 2 062 199 A (AIR FRESH UK LTD) 20 May 1981 see figures ---	1
A	US 5 394 506 A (STEIN ROBERT D ET AL) 28 February 1995 see claims -----	1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 97/00633

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5373581 A	13-12-94	NONE	
FR 2626452 A	04-08-89	NONE	
FR 2618330 A	27-01-89	FR 2598615 A FR 2613225 A	20-11-87 07-10-88
US 5432882 A	11-07-95	NONE	
US 4686353 A	11-08-87	US 4574181 A CA 1243733 A EP 0178119 A JP 61093314 A US 4692590 A	04-03-86 25-10-88 16-04-86 12-05-86 08-09-87
US 4574181 A	04-03-86	CA 1243733 A EP 0178119 A JP 61093314 A US 4686353 A US 4692590 A	25-10-88 16-04-86 12-05-86 11-08-87 08-09-87
US 4692590 A	08-09-87	US 4574181 A CA 1243733 A EP 0178119 A JP 61093314 A US 4686353 A	04-03-86 25-10-88 16-04-86 12-05-86 11-08-87
GB 2062199 A	20-05-81	NONE	
US 5394506 A	28-02-95	NONE	